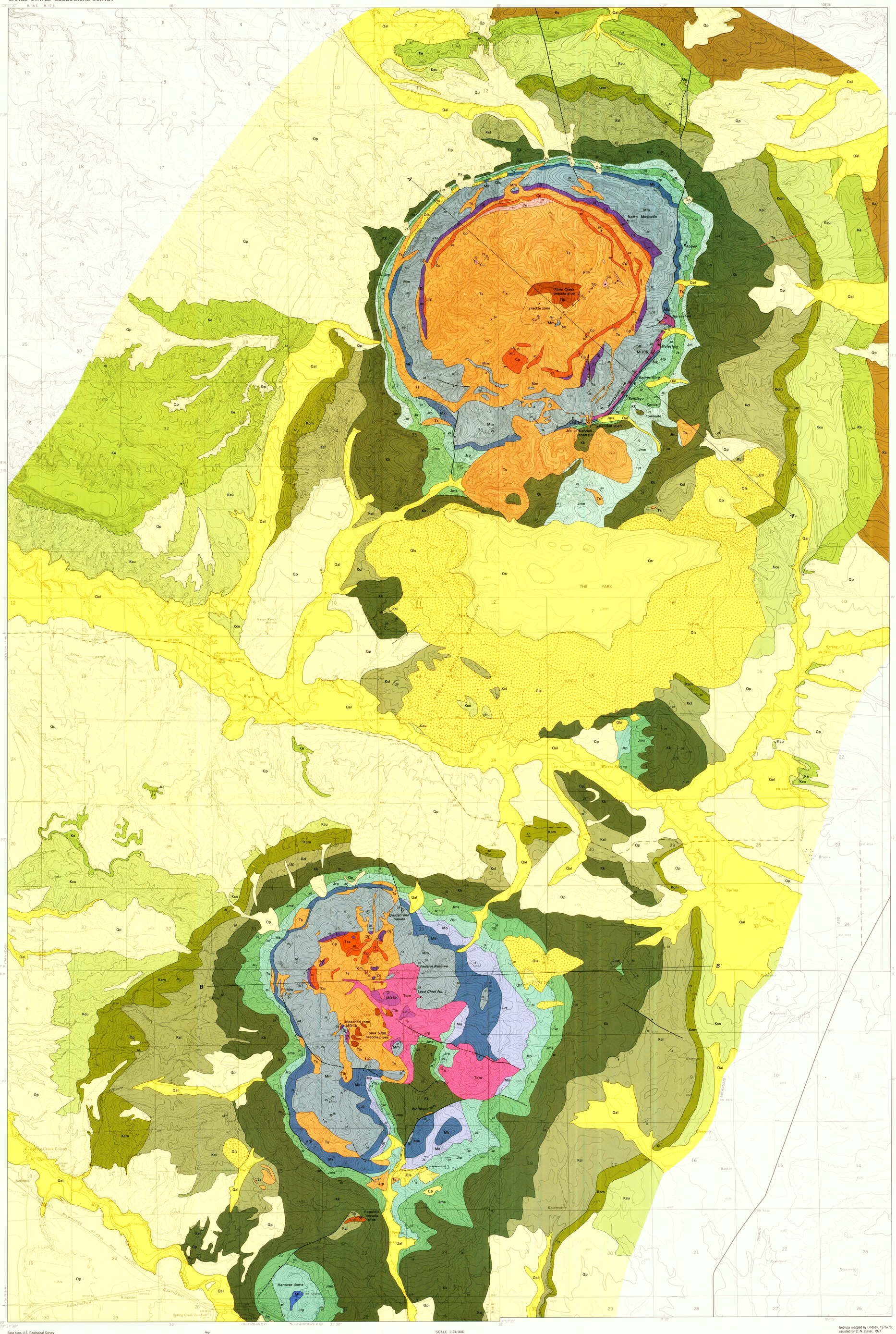
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I–1362



Base from U.S. Geological Survey Lewistown, 1:62,500, 1941, Spring Creek Junction, 1970, Seventytwo Hills, 1978, and Lewistown 25 W, unedited advance print, 1980

Geology mapped by Lindsey, 1976–78; assisted by C. N. Culver, 1977

CORRELATION OF MAP UNITS

Units	Epoch	Period
Qal, Qls, Qp, Qtr		QUATERNARY
Tib, Tqm	Paleocene(?)	TERTIARY
Tsa, Ts	Paleocene	TERTIARY
Kc	Upper Cretaceous	CRETACEOUS
Ke, Kcu, Kcm	Upper Cretaceous	CRETACEOUS
Kcl, Kk	Lower Cretaceous	CRETACEOUS
Jm, Jms, Jme	Upper Jurassic	JURASSIC
Js, Jms, Jme	Middle Jurassic	JURASSIC
Jrp, Jme	Middle Jurassic	JURASSIC
Mh	Upper Mississippian	MISSISSIPPIAN
Mo	Upper Mississippian	MISSISSIPPIAN
Mk	Upper Mississippian	MISSISSIPPIAN
Mm	Lower Mississippian	MISSISSIPPIAN
Dj, MDCb	Upper Devonian	DEVONIAN
Cp, MDCb	Upper Cambrian	CAMBRIAN
Cu, MDCb	Middle Cambrian	CAMBRIAN
pCs		PRECAMBRIAN

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (QUATERNARY) — Sand, gravel, silt, clay, and soil in stream valleys. Also includes low-level stream terraces and minor colluvium on valley walls

Qls LANDSLIDE DEPOSITS (QUATERNARY) — Extensive south and east of The Park, where large blocks of travertine cover slopes of Colorado Shale. At these localities, cliffs of travertine are being undercut by sliding and erosion of incompetent bentonitic shales in the Colorado Shale

Qp PEDIMENT DEPOSITS (QUATERNARY) — Colluvial and alluvial deposits of sand, gravel, and clay comprise a veneer on erosional surfaces at two or more levels. Extensive dissected pediments slope away from the northwest sides of both the North and South Moccasin Mountains, and small remnants of the pediments are found high on the sides of the mountains. Pediment gravels consist mainly of limestone, sandstone, and igneous rocks eroded from the mountains. Travertine fragments are present in pediment gravels at 4,500 ft (1,370 m) elevation northeast of North Moccasin triangulation station and at various elevations northeast of Rocky Butte, indicating that most, if not all, of the pediments are younger than the travertine (unit Qtr)

Qtr TRAVERTINE (QUATERNARY) — Light-pink, finely crystalline travertine. The travertine consists of thin to thick, flat-lying dense beds of nearly pure calcite separated by porous layers containing tubular molds; some of the larger molds may be impressions of cattail stems (Calvert, 1909). Travertine is most extensive on the upland known as The Park, where it covers about 8 km². Smaller occurrences are on Rocky Butte, on hills in SW 1/4 sec. 13, T. 16 N., R. 17 E., and 4 km southeast of Kendall townsite. A preliminary estimate of about 100,000 yrs B.P. was determined by the uranium-series method for the age of the travertine of The Park (B. J. Szabo, oral commun., 1979). Maximum thickness of the travertine is about 60 m on The Park

Tib INTRUSIVE BRECCIA (PALEOCENE?) — Breccia pipes intrude syenite porphyry (unit Ts) in both the North and South Moccasin Mountains and intrude the lower part of the Colorado Shale on the north side of the Hanover dome. Breccia in syenite porphyry is composed mostly of syenite fragments and a few fragments of pre-Paleocene rocks in a pulverized matrix of syenite. The matrix of breccia on the Hanover dome is Colorado Shale. The pipe on Plum Creek contains two large inclusions (shown on the map): one of limestone of the Madison Group, and the other of sandstone of the Kootenai Formation. Breccia pipes near triangulation station South (peak 5798) and the Hanover dome contain mineralized rock fragments having galena, cerussite, sphalerite, chalcopyrite, and malachite. Although alteration appears to have been slight, most breccia has been propylitized and argillized, and some has been silicified and pyritized. The pipes on peak 5798 are surrounded by bleached syenite porphyry, and the pipe on Plum Creek in the North Moccasin Mountains is next to a crackle zone in syenite porphyry; the zone is defined by fracture fillings of quartz, a weakly bleached appearance, and minor disseminated pyrite.

Tqm QUARTZ MONZONITE PORPHYRY (PALEOCENE)—Light-gray porphyry containing 40-50 percent phenocrysts in an aphanitic matrix. Phenocrysts are altered plagioclase (25-35 percent of the rock), fresh sanidine (5-10 percent), and quartz (3-5 percent). Ferromagnesian minerals are generally lacking because propylitic alteration has affected much of the rock. Conspicuous large (10-20 mm) euhedral phenocrysts of sanidine and small (≤3 mm) partly resorbed quartz crystals serve best to distinguish the rock from syenite porphyry, which it superficially resembles. Miller (1959) called the rock leucorhyolite, but it has the texture and mineralogy of quartz monzonite porphyry. A chemical analysis shows that this unit differs from syenite porphyry (unit Ts) only in having more SiO_2 and less total Fe and K_2O; low FeO may be due to alteration. The unit crops out only in the South Moccasin Mountains, where it forms part of the core of the central intrusive complex and underlies uplifted sedimentary rocks in the eastern part of the mountains. Quartz monzonite porphyry is younger than syenite porphyry (unit Ts), as shown by dikes of quartz monzonite that crosscut syenite between peaks 5775 and 5798. A K-Ar age of 64.2 ± 1.5 m.y. on sanidine indicates emplacement soon after syenite porphyry (Marvin and others, 1980); a fission track age of 75.4 ± 8.6 m.y. on zircon is regarded as questionable because dikes of the unit intrude syenite porphyry in the South Moccasin Mountains

Tsa ALKALI SYENITE PORPHYRY (PALEOCENE) — A variant of syenite porphyry (unit Ts) containing alined tabular phenocrysts of sanidine (25 percent of the rock) and plagioclase (5 percent), both about 5 mm in length and set in a gray aphanitic matrix. Other mineralogy and texture resembles that of syenite porphyry (unit Ts); however, chemical analysis (table 1 in pamphlet) shows that the rock contains more normative alkali feldspar (83.58 percent) than any syenite porphyry analyzed. Alkali syenite porphyry is confined to peak 5775 where its contacts with syenite porphyry are gradational. An age of 64.4 ± 1.5 m.y. was determined by the K-Ar method on sanidine (Marvin and others, 1980)

Ts SYENITE PORPHYRY (PALEOCENE) — Dark- to medium-gray porphyry composed of 28-54 percent euhedral phenocrysts in an aphanitic matrix. Phenocrysts are sanidine (10-25 percent of the rock), plagioclase (andesine, 15-38 percent), hornblende (1-10 percent), aegerine-augite (≥ 2 percent), quartz (≥ 4 percent), biotite (≥ 1 percent), magnetite (≥ 1 percent), and traces of sphene, apatite, and zircon. Sanidine phenocrysts measure as much as 30 mm in length; plagioclase and other phenocrysts range from 5 mm to 0.05 mm in length. Chemical analyses (table 1) show the syenite porphyry to be saturated with respect to silica. The rock is somewhat more siliceous and iron-poor than average calc-alkalic syenites of Nockolds (1954), but is designated syenite on the basis of mineralogy and past usage (Blixt, 1933; Miller, 1959). Syenite porphyry makes up the main intrusive complexes of the North and South Moccasin Mountains, sills in the southern part of the South Moccasin Mountains, and sill and dike-like apophyses of the main intrusive complex in each range. The main part of each intrusive complex consists of two syenite porphyry laccoliths intruded both below and, to a lesser extent, above limestones of the Madison Group. On peak 5798, dark-gray syenite porphyry intrudes medium-gray syenite porphyry; northeast of peak 5775, a large dike of dark-gray syenite porphyry intrudes medium-gray syenite porphyry and strata ranging from Cambrian to Mississippian in age. Two K-Ar ages of 64.1 ± 1.5 m.y. and 65.8 ± 1.6 m.y. on sanidine and four fission track ages on sphene, zircon, and apatite ranging from 62.1 ± 6.6 m.y. to 70.9 ± 9.0 m.y. indicate emplacement of the main intrusive complex of the North Moccasin Mountains about 66 m.y. ago (Marvin and others, 1980). In the South Moccasin Mountains, fission track ages of 64.8 m.y. on apatite, 55.6 ± 5.8 m.y. on zircon, and 62.6 ± 7.2 m.y. on sphene from syenite porphyry of peak 5798 yield an average age of 61 m.y.; however, an age older than 64 m.y. is indicated because the syenite porphyry has been intruded by dikes of quartz monzonite porphyry. One K-Ar age of 66.0 ± 1.5 m.y. on sanidine and one fission track age of 63.7 ± 6.6 m.y. on sphene from the sill south of peak 5642 yield an average of 65 m.y. (Marvin and others, 1980)

Kc CLAGGETT SHALE (UPPER CRETACEOUS) — Gray, tan, and black bentonitic marine shale; thickness not measured

Ke EAGLE SANDSTONE (UPPER CRETACEOUS) — Light-brown calcareous and ferruginous sandstone and lesser interbedded shale. Sandstone is medium to thick bedded and locally crossbedded. The Eagle is well exposed north of Warm Spring Creek in secs. 5 and 6, T. 17 N., R. 17 E., where Rice (1976) measured, from top to bottom, an upper sandstone member 14 m thick, a middle member containing 27 m of sandstone and 26 m of shale, and the Virgelle Sandstone Member, which is 23 m thick. Contacts at the top and bottom of the Eagle are conformable and gradational. Estimated total thickness of the Eagle varies from about 90 to 120 m

Kcu TELEGRAPH CREEK FORMATION (UPPER CRETACEOUS) AND COLORADO SHALE, UPPER PART (UPPER CRETACEOUS) — These strata were mapped undivided, and are tentatively correlated with the Telegraph Creek Formation and with equivalents of the underlying Colorado Shale described by Cobban (1951); they are described from a section measured in sec. 8, T. 18 N., R. 18 E. These units are, from top to bottom: (1) Poorly exposed brown and gray siltstone and shale 12 m thick assigned to the Telegraph Creek Formation. (2) Dark-gray calcareous and bentonitic shale containing bentonite beds and calcareous concretions as much as 1 m in diameter and 0.3 m in thickness; the unit is 148 m thick and is considered equivalent to the Niobrara Shale. (3) Dark-gray bentonitic shale (equivalent to the Carlile Shale) 39 m thick, containing prominent intervals of ferruginous septarian concretions. (4) A heterogeneous interval of gray calcareous shale and bentonite, brown silty shale and, in the lower part, two beds 1-3 m thick of soft gray sandstone and siltstone separated by 22 m of gray shale. The sandstone beds of the lower part contain gastropods and oysters that indicate correlation with the Mosby Sandstone Member of the Greenhorn Formation (W. A. Cobban, oral commun., 1977). Unit 4 is 42 m thick and is probably equivalent to the Greenhorn. (5) Blue-gray and blue-black shale, some of which is bentonitic; the unit is 29 m thick and is equivalent to the Belle Fourche Shale. Total thickness of units mapped as Kcu is about 270 m

Kcm COLORADO SHALE, MIDDLE PART (LOWER CRETACEOUS) — Three rock units, described from a section measured in sec. 8, T. 18 N., R. 18 E., were mapped as the undivided middle part of the Colorado Shale. Additional measured sections near the North and South Moccasin Mountains are given by Reeside and Cobban (1960, p. 41-42), whose work provides the basis for assignments given here. From top to bottom, the three units are: (1) Ridge-forming light-brown sandstone and siltstone with abundant fish scales and ripple marks; the unit is 50 m thick and is assigned to the Mowry Shale Member. (2) An unnamed gray shale member, 10 m thick. (3) Gray-green silty bentonite, 5 m thick; designated the Arrow Creek Member by Reeside and Cobban (1960). The bentonite crops out as a light-gray barren strip below ridges of Mowry and provides an excellent marker for subdivision and mapping of the Colorado Shale. Total thickness of the three units in Kcm is about 60 m

Kcl COLORADO SHALE, LOWER PART (LOWER CRETACEOUS) — Three units of the lower part of the Colorado Shale, described from a section measured in sec. 8, T. 18 N., R. 18 E. and mapped undivided, are correlated with equivalents of the Colorado Shale as described by Cobban (1951). From top to bottom, the members are: (1) Gray and brown silty and sandy shale, thin (1-4 cm) brown siltstone beds having ripple marks, and scattered brown massive to crossbedded sandstone beds as much as 1.5 m thick; unit 1 is 157 m thick; equivalent to the Newcastle Sandstone. (2) Black and gray-black shale containing abundant ferruginous concretions and gypsum rosettes, 76 m thick, assigned to the Skull Creek Member. Concretions contain fossils of oysters and *Inoceramus* clams resembling the fauna described by Cobban (1951, p. 2176) from near Grassrange, Mont. (3) Ridge-forming brown, thin-bedded sandstone, siltstone, and shale with ripple marks and burrows; 16 m thick; assigned to the Fall River Sandstone Member. Base of Colorado Shale is probably gradational. Total thickness of Kcl is about 250 m

Kk KOOTENAI FORMATION (LOWER CRETACEOUS) — Characterized by black and maroon mudstone in the upper part and ridge-forming, coarse-grained salt-and-pepper sandstone in the lower part. The salt-and-pepper appearance is caused by light-colored quartz grains and dark chert grains. A measured section near Kendall townsite at sec. 32, T. 18 N., R. 18 E. contains, from top to bottom, 94 m of black mudstone, 32 m of maroon and blue-black mudstone, 13 m of brown sandstone, siltstone and shale, 1 m of black shale, and 25 m of crossbedded, coarse-grained salt-and-pepper sandstone. Upper contact believed to be gradational; basal contact sharp. Total thickness 165 m

Jm MORRISON FORMATION (UPPER JURASSIC) — Red and brown mudstone, siltstone, and sandstone; gray micritic limestone; and, near the top, impure coal — all deposited in a continental environment. A measured section at the north side of Kendall townsite (sec. 32, T. 18 N., R. 18 E.) contains, from top to bottom, 6 m of brown siltstone and shale, 8 m of gray-brown mudstone and impure coal, 12 m of red-brown mudstone and siltstone, 14 m of gray micritic limestone, 10 m of gray-brown sandstone and shale, and 13 m of dark-brown shale. Upper contact is sharp; basal contact is poorly exposed. The Morrison has about twice the background radioactivity of adjacent strata. Total thickness, as measured at two sections, 63-65 m

ELLIS GROUP (UPPER AND MIDDLE JURASSIC) — Swift, Rierdon, and Piper Formations

Js Swift Formation (Upper and Middle Jurassic) — Brown glauconitic calcareous sandstone, siltstone, and claystone; sandstone contains abundant ripple marks and cross-lamination. A ridge-forming marker bed, about 1-3 m thick, of coarse-grained sandstone and conglomerate containing abundant oyster-shell fragments occurs in the lower part of the Swift Formation. Upper contact is poorly exposed; basal contact is sharp. Thickness 20-40 m

Jrp Rierdon and Piper Formations (Middle Jurassic) — The Rierdon Formation consists mostly of poorly exposed gray to brown shale and lesser amounts of thin-bedded gray limestone. Oysters, identified as *Gryphaea nebraskensis* and *Ostrea* (R. W. Imlay, written commun., 1977), are locally abundant. The Rierdon is about 30-40 m thick. Below the Rierdon, the Piper Formation contains about 15 m of poorly exposed shale and limestone, underlain by a widespread ridge-forming marker bed of thin-bedded dark-gray limestone, 4-6 m in thickness, which in turn is underlain by about 40 m of dark-gray to black shale, thin-bedded gray and tan limestone, and gypsum. The upper shale and limestone of the Piper Formation does not contain gypsum at the surface, but may correspond to claystone and gypsum in the upper part of the Piper described near Heath, Mont. (Imlay, 1952, p. 83). The dark-gray limestone marker bed ranges from micritic to oolitic and contains abundant small digitate stromatolites, *Isocyprina*? and other fragmentary clams, as identified by R. W. Imlay (written commun., 1977); it may correspond to the middle limestone of the Piper described by Imlay (1952) near Heath. Minor limestone solution breccia accompanies veinlets and pods of gypsum in the lower part of the Piper. Silicified colonial coral resembling *Astrocoenia hyatti* Wells (R. W. Imlay, written commun., 1977) occurs in shale 5-15 m above the base of the Piper. Thickness of the Piper is about 60-70 m. Well-exposed sections were measured 1 km northwest of Rocky Butte in sec. 36, T. 17 N., R. 17 E. (described also by Miller, 1959), and 1 km east of the North Moccasin triangulation station in sec. 20, T. 18 N., R. 18 E.

Jms MORRISON AND SWIFT FORMATIONS (UPPER AND MIDDLE JURASSIC) — Undivided; each unit described above

Jme MORRISON FORMATION AND SWIFT, RIERDON, AND PIPER FORMATIONS OF THE ELLIS GROUP (UPPER AND MIDDLE JURASSIC) — Undivided; each unit described above

BIG SNOWY GROUP (UPPER MISSISSIPPIAN) — Consists of the Heath, Otter, and Kibbey Formations. The group thins northwestward in the North and South Moccasin Mountains because it was tilted and beveled by erosion between Late Mississippian and Middle Jurassic time. The Heath Formation has been entirely removed by erosion north of Hanover dome, and the Otter Formation is missing from the northwestern half of the South Moccasin Mountains and throughout the North Moccasin Mountains. Only the Kibbey Formation extends to the northwest side of the North Moccasin Mountains

Mh Heath Formation — Black shale and thin beds of dark-gray fossiliferous limestone. Limestone contains abundant brachiopods. The Heath is exposed only on the Hanover dome at secs. 22 and 27, T. 16 N., R. 17 E. Miller (1959) mapped shale and limestone on the south and east slopes of the South Moccasin Mountains as Heath, but these strata are mapped here as Rierdon and Piper Formations on the basis of lithology and oysters found within them. Base is not exposed; upper contact with Piper Formation is sharp but poorly exposed. Total thickness is not known; Maughan and Roberts (1967, p. 89) described a section 26 m thick 18 km southeast of Heath, Mont.

Mo Otter Formation (Upper Mississippian) — Thin-bedded gray limestone and tan shale. Most limestone is micritic, but thin oolitic and coquinoid limestones also occur. Brachiopods and crinoid columnals are locally abundant. Upper contact with Piper Formation is sharp but poorly exposed; basal contact is generally sharp. The best exposures are located in the South Moccasin Mountains, along the road in sec. 11, T. 16 N., R. 17 E., where the Otter is 40 m thick

Mk Kibbey Formation (Upper Mississippian) — Fine-grained brown quartz sandstone and siltstone, in places approaching brick-red in color. Contacts are generally sharp. Thickness is 58 m in sec. 20, T. 18 N., R. 18 E., located 1 km east of North Moccasin triangulation station, and about 40 m in sec. 11, T. 16 N., R. 17 E., in the South Moccasin Mountains

Mm MADISON GROUP (UPPER AND LOWER MISSISSIPPIAN) — Limestones of the Madison Group form bold outcrops within the main mass of the mountains. The Madison Group, not subdivided for mapping, contains the Mission Canyon (Upper and Lower Mississippian) and Lodgepole (Lower Mississippian) Limestones as described by Sando and Dutro (1974). The Mission Canyon Limestone consists of 200 m of massive, medium- to thick-bedded gray limestone and solution breccia. Solution breccia beds are laterally extensive for a kilometer or more. Beneath the Mission Canyon Limestone, the Lodgepole Limestone is divisible into the Woodhurst Member at the top, which consists of about 90 m of thin-bedded, gray limestone, and the Paine Member at the base, which consists of 30 m of thin-bedded, cherty gray limestone. The Madison contains abundant fossil brachiopods, corals, and crinoid columnals. Both upper and lower contacts are sharp. Total thickness is about 320 m

Dj JEFFERSON FORMATION (UPPER DEVONIAN) — Thin- to medium-bedded, dark-gray and tan, crystalline dolomite and minor gray limestone. The dolomite has a characteristic saccaroidal and vuggy aspect, and has a fetid odor when struck with a hammer. Algal stromatolites, burrows, and poorly preserved fossil *Amphipora* (J. T. Dutro, Jr., written commun., 1980), atrypid and ambocoelid brachiopods, thamnoporoid corals and crinoid columnals are found locally. A 10-m-thick bed of tan solution breccia of dolomitic limestone occurs about 75 m below the top; it is underlain by about 5 m of thin-bedded dolomite and gray bioclastic limestone at the base of the Jefferson Formation that contains fossil gastropods, identified as *Orecopia* of Late Devonian age by E. L. Yochelson (written commun., 1980), and ostracodes, brachiopods, and echinoderm fragments (J. T. Dutro, Jr., written commun., 1980). Similar beds containing the same fossils occur near the base of the Jefferson Formation in the Big Snowy Mountains (Lindsey, 1980). The best exposed sections are on the west side of peak 5775 in sec. 34, T. 17 N., R. 17 E. in the South Moccasin Mountains and at various locations in the northern part of the North Moccasin Mountains. Both lower and upper contacts are sharp. Thickness of the Jefferson Formation is about 100 m

Cp PILGRIM LIMESTONE (UPPER CAMBRIAN) — Thin-bedded, gray to tan, laminated limestone and intraformational limestone-pebble conglomerate. Also, variegated red, dark-gray, and gray-green shale and mudstone. The uppermost 3 m of limestone, exposed south of North Moccasin triangulation station, contains fragments of the fish *Anatolepis*? sp. (J. E. Repetski, written commun., 1979) and fragments of trilobites of Late Cambrian age (M. E. Taylor, oral commun., 1978). Variegated red and tan calcareous mudstone and shale, 3 m in thickness, underlies the upper limestone at North Moccasin triangulation station; the unit may be the lithic equivalent of the Dry Creek Shale Member of the Snowy Range Formation, noted in the Big Snowy Mountains (Lindsey, 1980). Strata similar to those of the upper part of the Pilgrim Limestone were described by Miller (1959) from west of peak 5775 in the South Moccasin Mountains; he assigned them to the Devonian Maywood and Cambrian Snowy Range(?) Formations, but I have mapped them with the Pilgrim. More limestone and subordinate shale compose the lower part of the Pilgrim Limestone on the east slope of peak 5775 and in the North Moccasin Mountains. Much of the lower part of the Pilgrim is in large xenoliths and appendages that have been split off the main mass of Paleozoic rocks by intrusion of syenite porphyry; one such appendage, located south of North Moccasin triangulation station, is 3 km in length. Metamorphism of xenoliths is limited to crystallization of sericite and epidote and a general increase in induration of shaley beds. Upper contact with Jefferson Formation is sharp but poorly exposed; lower contact with underlying shale and limestone is gradational. Thickness about 60 m

Cu SHALE, LIMESTONE, AND QUARTZITE, UNDIVIDED (UPPER AND MIDDLE CAMBRIAN) — Gray-green, rusty-weathering laminated calcareous shale and lesser tan limestone, including laminated limestone and intraformational conglomerate. These beds are found only in the North Moccasin Mountains, mainly interleaved with sill-like apophyses of the main syenite porphyry intrusion and as xenoliths in syenite porphyry. In the northwestern part of the mountains, as much as 25 m of thin-bedded, fine-grained pink quartzite is interbedded with gray-green sericitic shale near the base of the undifferentiated Cambrian strata. The quartzite and shale may belong to the uppermost part of the Flathead Quartzite. Large xenoliths of Flathead Quartzite occur near Plum Creek and at sample locality 20 in the North Moccasin Mountains. In sec. 13, T. 18 N., R. 17 E., Blixt (1933) described and measured 220 m of undifferentiated Cambrian strata, which includes strata mapped herein as the Cambrian Pilgrim Limestone

MDCb SILICIFIED AND BRECCIATED SEDIMENTARY ROCK (MISSISSIPPIAN, DEVONIAN, AND CAMBRIAN) — Red and brown, rusty-weathering limestone, shale, and quartzite that have been silicified and, in some places, brecciated. Associated with faults and contacts with intrusive rocks. These rocks are principally found in the North Moccasin Mountains west of Kendall townsite, where siliceous and ferruginous fault breccia at the top of the Madison Group extends 2½ km along strike; this was the principal host of gold mined in the Kendall district. Similar localities are found in the South Moccasin Mountains, where siliceous and ferruginous limestone in the lower part of the Madison Group and the Jefferson Formation are in contact with intrusive syenite and quartz monzonite porphyry. Some of these localities have also been mineralized. The xenolith of brecciated, rusty-weathering ferruginous rock in the west part of sec. 1, T. 17 N., R. 16 E. is in part composed of altered Flathead Quartzite

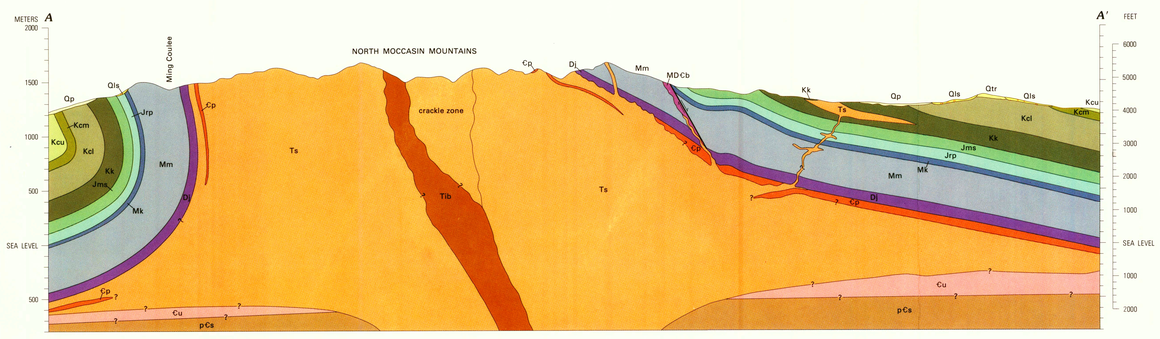
pCs BIOTITE SCHIST (PRECAMBRIAN) — Black biotite schist of Precambrian age that contains abundant biotite, quartz, and potassium feldspar, and minor chlorite, epidote, and garnet. The schist occurs only as xenoliths in syenite porphyry of the North Moccasin Mountains along Plum Creek

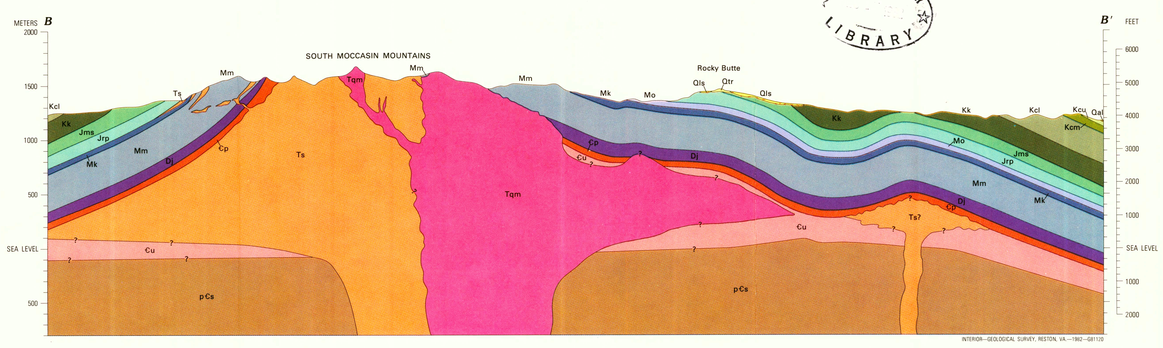
CONTACT — Dashed where approximately located

FAULT — Dashed where inferred, dotted where concealed. Ball and bar on downthrown side

STRIKE AND DIP OF BEDDING
- Inclined
- Vertical
- Overturned
- Horizontal

MINERALIZED LOCALITIES — Locality numbers are for reference in text and in tables 3 and 5 (in pamphlet)
- Quarry or open pit
- Abandoned quarry or open pit
- Vertical shaft
- Inclined shaft
- Inaccessible adit
- Prospect
- Natural outcrop or road cut (mineralized)





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GEOLOGIC MAP AND DISCUSSION OF SELECTED MINERAL RESOURCES OF THE NORTH AND SOUTH MOCCASIN MOUNTAINS, FERGUS COUNTY, MONTANA

By
David A. Lindsey
1982

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